PROJECT NUMBER: 2501
PROJECT TITLE: Smoke Chemistry
PROJECT LEADER: R. Comes
PERIOD COVERED: April, 1989

I. SIDESTREAM SMOKE

A. **Objective**: Conduct studies on sidestream smoke including: development of methods for collection and analysis of sidestream gas phase and semivolatiles; visibility determinations; analysis of selected materials relating to sidestream odor and irritation; development of proprietary products.

B. **Status**: 1.) A number of gas phase runs have been made utilizing the Tekmar desorber under varying conditions to attempt to establish an optimal standard operating procedure. Changes have been studied varying both sample collection procedures and gc temperature program conditions. Problems with plugging of the desorber continue to be a significant cause of system down time. Development of this methodology will continue. 2.) Efforts to correlate subjective attributes of gc gas phase peaks have continued. A chromatogram was produced using the PE LIMS system. Peak retention times and mass spectral identifications were included. Comparison of the chromatogram with odor profiles indicated that the compounds identified were not those responsible for the intense odors detected. To address this finding, a more sensitive sulfur detector has been ordered to study possible differences in the profiles of the gas phase sulfur compounds. 3.) Routine BET surface area measurements and single port visibility determinations continue to be run as requested. A discrepancy between the extinction measured by the computer and the extinction shown on the chart paper was noted with the single port apparatus. Various system checks tend to indicate the problem is associated with electrical line noise. This situation is being addressed. 4.) The second 8-port smoking machine has arrived. All components for set up of this second visibility apparatus are either on-hand or under construction. Modifications to the first 8-port system continue as needed in order to make this system as operator "friendly" as possible. Certification of this system utilizing United States Testing Co. is currently underway. A series of calibrations and test runs will be made in support of this certification procedure. 5.) A significant project effort was directed at modification and operation of the CORESTA sidestream smoking machine. This apparatus was originally designed to smoke conventional diameter, 85mm cigarettes. In order to smoke cigarettes of 100mm length and/or 17mm diameter, new chambers were designed and built. These larger chambers required significant modifications to the sidestream air flow which then required the installation of a new flow monitoring system and several related alterations to the overall apparatus. Once acceptable conditions (based on correct MSTPM and static burn times for controls) were established, a series of six cigarettes (Monitor-25, Vantage Excel, Marlboro Light 100's, B&H 100's, Trim X and Capri) were smoked. Sidestream TPM, nicotine and water data

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were obtained under both static and dynamic smoking conditions. Comparable mainstream data was generated during the dynamic smokings. A report is currently being written. These cigarettes are also being studied for visibility using the single port visibility apparatus. 6.) The program to measure the condensible build-up in a burning cigarette continues using neutron radiography. Several runs have been made using varied models. The large amount of data generated in these runs is presently being analyzed.

II. SIDESTREAM SMOKING CHAMBER

A. **Objective**: Design and construct an environmentally controlled chamber to measure selected components of sidestream smoke.

B. **Status**: 1.) A visit was made to the facility where the chamber is being constructed. Pending some relatively minor modifications, the chamber was accepted and should be delivered to P.M. on May 1. Installation and check-out should require two weeks. 2.) Additional chamber instrumentation has been ordered to facilitate analysis of some other components.

III. MISCELLANEOUS

1. A series of cigarettes to determine nicotine delivery to sidestream is being smoked on the CORESTA apparatus. Seven models with varied levels of nicotine added to ART filler have been made and will be evaluated for sidestream TPM, nicotine, water and static burn time. The control is a zero add-back to the ART filler.

2. Thirty-four samples were analyzed for nicotine in support of the Sepracor program.

3. Multiple samples have been analyzed by gc/ms and pyrolysis/gc/ms as requested.

4. Neutron activation analyses continue to investigate the potential transfer of aluminum to smoke in control vs sol-gel treated cigarette papers. Condensate from four experimental cigarettes (IR4F, D9UR, D9US and D9US-1) was collected directly into acid washed vials. The condensate was activated and then transferred to non-irradiated vials to eliminate vial activity contamination. Data evaluation is underway.

5. Various CORESTA sidestream chambers were examined with schlieren, visual and infrared cameras in conjunction with J.J. Piade from FTR. The flow of the smoke in the different chambers with different draft velocities was investigated with the schlieren (did not work due to interference from the chamber walls) and the visual cameras. The infrared camera work was to examine the effect of the draft velocity in each chamber on the coal temperature distribution. This data has yet to be analyzed.

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6. Section and total distribution data have been obtained on the labelled cigarettes prepared in support of the Biochemical Research Division nicotine precursor/product study. These results have been summarized in a memo.

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